425.d

MEMORANDUM

PRELIMINARY GROWTH RING STUDIES

Northfork, Calif.

March 10, 1924

H. L. Person

Junior Entomologist.

MEMORANDUM

Growth Ring Studies.

The principal points considered have been the effect of precipitation on growth rings and the relation of size of growth ring to resistance and susceptibility to attack by D. brevicomis. The results of the preliminary work done at Northfork may be of interest to the other men working along the same lines.

Increment cores have been taken from 130 yellow pine together with site and tree data on the form cards. The most sensitive rings, those showing the most contrast in width, would be the best suited for studying the effect of precipitation. Such rings are usually found on trees in the dryer sites where the moisture supply is intermittent and most directly affected by rainfall. Thirteen of these sensitive cores, from a variety of sites were photographed and enlarged to from 4 to 8 times the natural size. These enlargements are very satisfactory for a study of growth rings.

To test the relation between width of ring and precipitation on these cores a scale was drawn in which the heaviest yearly precipitation was equal to the widest growth ring for the same period. Thus, if there was a direct relation between rainfall and width of ring the precipitation scale would fit the growth rings of the core on which it was based. Using this scale, the precipitation for each year from 1904-1905, the first year for which we have precipitation records at Northfork, to 1923 was compared

with the growth ring for the following season. That is, the rainfall from August 1904 to June 1905 inclusive, would be compared with the growth ring for 1905. Although a few of the rings could be connected up directly with rainfall the relation on the basis of all rings was less than 50%, which of course shows no relation at all. This indicates that growth rings cannot be depended upon as an index to the amount of percipitation. It is believed, however, that rainfall graphed against ring width, based on a large number of trees, will probably show some relation between the two, tho too indefinite to be of any use in forecasting epidemics. This will be worked up when a large enough number of cores are on hand and time permits.

The work on the relation between the ring width and the amount of infestation looks a little more encouraging. Two different lines of attack were followed. The first was to compare the rings from D.b. killed trees with those from living trees on the same site. Using cores from 18 living trees and 34 D.brevicomis killed trees as a basis it was found that the D.brevicomis trees killed in 1922 were growing at the rate of .054 cm. per year during 1920 and 1921 while the living trees were growing at the rate of .106 cm. per year during the same years. The D.b. trees killed in 1923 were growing at the rate of .035 cm. per year during the years 1920, 21 and 22 while the living trees on the same site were growing at the rate of .102 cm. per year for the same period. Apparently the D.b. killed trees were growing from 1/3 to 1/2 as fast as the living trees on the same sites. The average diameter of the D.b. and living trees was about the same. This makes it look as though the slow growing trees are

more susceptible to attack by D.b. or are less able to resist than the faster growing trees. More cores and a more accurate method of measuring the finer rings will be needed before any definite conclusion can be drawn. The use of the micrometer disc, which has just been received, will increase the accuracy of the measurements.

The other method of attack was to take cores from trees on sites which are noticeably free from D.b. infestation and compare their ring growth rings with trees of the same approximate diameter on sites subject to heavy D.b. infestations. This is the most promising lead yet taken up at this station. Only 23 cores have been taken from the sites free from D.b. infestation and these were compared with 52 cores from sites with fairly heavy D.b. infestations. The 52 trees from D.b. sites include 18 living trees and 34 D.b. killed trees. The rate of growth was figured from the years 1920, 1921 and 1922 for the living trees on both sites and for the D.b. trees killed in 1923. For the trees killed in 1922 the 1920 and 1921 growth only, was used. This was done to eliminate the effect of attack where the attack was made before the end of the growing season. On the basis of the above it was found that the average width of the annual ring for 1920 1921 and 1922 was .252 in the trees on sites free from infestation and .065 on sites having a heavy D.b. infestation. Ten of the cores included in the above were from the Jackson experiment in a creek flat where the growth was abnormally fast. But even if these 10 cores were not included, the average rate of growth for the trees on sites free from infestation would be .160 cm. per year which is about 2½ times the growth rate on sites with heavy D.b. infestation.

The purpose of the work so far has been to find some promising lead on which to work as with the limited time available it would not be

possible to cover the whole field. Whatever time is available during the coming season will be used at this station to work on the last point brought up, namely the comparative rate of growth of trees on sites free from D.b. infestation and on sites having a heavy D.b. infestation.

Junior Entomologist.

PLATE I.

The five cores on this plate were selected for use in studying the effect of precipitation on ring growth. Enlarged 8 x. They are from living trees having sensitive rings.

The scale on the left is a precipitation scale. The heaviest precipitation period (1910-11) is represented by a spore equal to the largest growth ring (1910) on core #4, and the other species are in proportion according to the amount of rainfall. (As the original scale was too large to go on the plate it was reduced $\frac{1}{2}$) The 1910-11 rainfall would affect the 1911 ring. Although the rainfall for 1910-11 was nearly twice as great as for 1909-10, the growth ring for 1911 is smaller than the 1910 ring. The 1912, '13 rings show a direct relation to rainfall but the 1907 '08 rings are far out of proportion with the amount of rainfall.

Other consistencies and inconsistencies are evident from a study of the plate.

PLATE II.

Cores 1, 2, 3, 4 collected from the Jose Basin by Forest Examiner, Sanford. Enlarged 4½ x

The rings on cores 1 and 2 are fairly sensitive and the rings on 4 are quite sensitive. Core 3 shows very complacent growth.

1, 2 and 4 were used in studying the effect of precipitation on ring width.

The scale shown is a millimeter scale with the same enlargement as the cores. All of these cores were from living trees.

PLATE III.

Cores F 5 j, F 6 j a, F 6 j, F 6 j b, Enlarged 8½ x.

These cores were from trees in the Jose Basin and show what is believed to be an exception to the general rule. In this case the cores from D.b. killed trees show a faster growth than the living trees on the same site.

Cores F 5 and F 6 are from trees 12 and 22 inches in diameter, respectively and were killed by D. b. in 1922.

Cores F 6 a and F 6 b are from living trees 10 and 16 inches in diameter respectively.

All of these trees were on an open gentle slope with a N. E. exposure.

Cores F 5 and F 6 show the nature of "complacent" rings, those least affected by climatic conditions. Cores F 6a and F 6 b show the nature of "sensitive" rings, those most easily affected by climatic conditions and so best adapted for the study of the relation of precipitation to ring width.